

STATISTICAL SURVEY OF THE CONSUMPTION OF THE PRODUCTS FROM SEMINATURAL ENVIRONMENT IN THE CZECH REPUBLIC

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The central aspect of the work in international project SAVEC (Spatial Analysis of Vulnerable Ecosystems in Central Europe) is the identification of vulnerable areas. These are areas which, by virtue of the processes governing the transfer of radionuclides through food-chains, deliver high radionuclide fluxes to man. Identification of vulnerable areas is essential in establishing where intervention levels are likely to be exceeded in the event of a nuclear accident. Vulnerable areas could be identified using many criteria, a.o. high production rates of certain foodstuffs which substantially accumulate specific radionuclide. In addition to environmental factors, social factors will also contribute to vulnerability, in particular, dietary preferences can lead to the ingestion of more contaminated foodstuffs.

Since Chernobyl accident, it is well known fact that in the Czech Republic, the most contaminated foodstuff is coming from seminatural ecosystem (mushroom, forest berries and game). However, critical group as to the size and composition was not quantitatively evaluated up to now.

Therefore, in the frame of SAVEC project, a statistical survey with the aim of finding critical group of inhabitants in the Czech Republic was performed. The survey was performed by a specialised marketing agency AMASIA [1]. It was aimed at the consumption of products from seminatural environment – mushrooms, forest berries and game. Two independent sub-surveys were performed.

The first one, aimed at randomly selected households from phone directory, had a goal to obtain 1500 interviews among the whole population. In individual regions, number of respondent was selected according to the number of inhabitants of the region.

The second survey was aimed at the hunters and their households. Mostly members of the hunting association were included into survey as there is only small number of professional hunters in the Czech Republic. The criterion was chosen that the respondent has to be hunter, gamekeeper or similar profession who consumed game at least ten times during the last year. The aim was to obtain at least 400 interviews. This survey was performed through interviewers.

People were asked if they consumed game, mushroom or berries last year and afterwards, if they asked “yes”, they were asked to quantify it. People were asked also some additional questions about their age, sex, profession, education, number of household's members, place of residence and the size of it. These additional questions enabled to estimate how representative from the statistical point of view the group is.

Also the size of the critical group was estimated – under the assumption that through the consummation of game the highest intake of ^{137}Cs could occur. During the survey of the critical group (hunting association) people were asked to estimate how many of their colleagues – members of the hunting association consume more than 5 kg of game per year. Average estimation was that 36% of colleagues consume more than 5 kg per year. There is altogether 98 836 members of hunting association and 36% of it is about 35 600 people.

From the survey among households 21,6% answered that they consume game. From this amount, 1,2 % answered that they consume more than 5 kg per year. It means that 0,25% of inhabitants consume more than 5 kg of game per year. The number of the inhabitants of the Czech Republic is about 10 000 000 people, so the critical group is about 25 000 people. This estimate is very close to the estimate from hunting association.



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As a result, we suppose that about 30 000 people in the Czech Republic consume more than 5 kg of game per year and this group is a critical group.

Table 1 Example of quantification of product consumed by an individual and number which was used in statistical evaluation

Question from interview	Estimated mid-interval for use in calculation
more than 5 kg	7
about 3 ÷ 5 kg	4
about 2 kg	2
about 1 kg	1
less than 1 kg	0.75
less than 0.5 kg	< 0.5

Normal distribution and logarithmic normal distribution were used for the calculation of medians and geometric and arithmetic means and statistical errors. There were no very big differences among the calculated averages in the most cases. The results from logarithmic normal distribution were used as the logarithmic normal distribution probably describes the reality in the best way. Formulation of the questions in questionnaires are given in the first column of the table 1. The number substituted for the given interval is in the second column. Calculated average from the distribution was afterwards corrected for the number of positive answers.

When members of the assumed critical group (hunters) were asked on consumption of game and if they answered that they consume more than 5 kg, they were asked to quantify it. In this case, all these numbers were used for the logarithmic normal distribution.

Table 2 The results of two dietary surveys in the Czech Republic.

Average consumption of the products from seminatural environment by the Czech population and by selected critical group (arithmetic averages calculated from logarithmic – normal distribution)		
Item	Average consumption by population (kg/y)	Average consumption by critical group (kg/y)
Mushroom	2,4	3,4
Forest berries	1,5	2,85
Game	0,28	6.23 (14.7) *)

*) Calculated for selected group with consumption more than 5 kg game per year.

Surveys among assumed critical group in smaller scale were performed in Poland and Hungary. In Poland 25 people were interviewed, in Hungary, altogether 79 people were included into study, The settlements in which people were interviewed in Hungary are in mountains, covered by forest. The people interviewed in Hungary and Poland were hunters, forest engineers and amateur hunters.

Results from surveys were compared with the similar survey from EU countries.

Table 3 Comparison with other countries [2]

	Estimated average consumption (kgfw/person/year)			Summary of national hypothetical wild food consumption (kgfw/person/year)		
	Game	Mushroom	Berries	Game	Mushroom	Berries
Austria	1,0			15	6	4
Belgium +Luxembourg	0,02			15	6	4
Denmark	0,7	0,4	0,6	15	2	4
Finland	1,9	1,5	8,4	16,6	2,3	13
France	0,5	0,03		15	6	4
Germany	0,5	0,01		20	9,9	4
Greece				15	6	4
Ireland				15	6	4
Italy		0,03		15	6	4
Netherlands	0,11			15	6	4
Norway	2,6	0,2	2,5	17,8	0,9	6,6
Portugal				15	6	4
Spain	0,4	0,1		15	6	4
Sweden	3,5	0,9	5,1	16,7	2,1	7
UK	0,1			9	1,8	4
<i>Czech Rep</i>	<i>0,28</i>	<i>2,4</i>	<i>1,5</i>	<i>6,2 (14,7)</i>	<i>3,4</i>	<i>2,8</i>
<i>Poland</i>				<i>23,3</i>	<i>2,4</i>	<i>1,3</i>
<i>Hungary</i>				<i>6,9</i>	<i>3,6</i>	<i>2,1</i>

Consumption of game, mushrooms and forest berries by the Czech population and by critical group resulting from statistical survey was compared with expert judgment, used by us in previous SAVEC report [3].

Consumption of **game** is in good agreement with previous estimation for both population and critical group. Also, in comparison with other countries our results are in quite good agreement.

Consumption of **forest berries** is rather high, however, again, it is in good agreement with other countries.

Consumption of **mushroom** is very high for the Czech population. For the critical group, it seems again to be in quite good agreement with other countries, however, for the

population it is the highest from all countries given in table 2, 3. It is lower than e.g. consumption of mushroom in village Veprin in Russia (Briansk Region) [4].

To estimate how realistic the conclusions of the statistical study were, ad hoc small survey was performed among the employee of the NRPI in Prague and NRPI dependence in Hradec Králové. Altogether 40 people answered within 4 days; surprisingly, average amount of mushrooms consumed was even higher than the one from nation – wide survey.

Table 4 Calculated yearly intake of ^{137}Cs by the Czech population and by the critical group.

	Factor of losses by culinary preparation	Average activity (Bq/kg)	Consumption – population (kg/y)	Consumption – critical group (kg/y)	Intake of ^{137}Cs - population (Bq/y)	Intake of ^{137}Cs - critical group (Bq/y)
Mushroom	0,5	700	2,4	3,44	840	1204
Forest berries	0,5	10	1,5	2,85	7,5	14.25
Game	0,3	150	0,28	6,23	12,6	280
Sum					860	1498

Yearly intake of ^{137}Cs , calculated from products coming from seminatural environment is much higher than yearly intake calculated from yearly survey of internal contamination through whole body counting and urine measurements. The reason of disagreement are further investigated – it is possible that the yearly survey do not cover representative sample of inhabitants. Possible overestimation of ^{137}Cs activity in mushrooms was, up to now excluded.

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References

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